

REMARKS

The Official Action mailed February 5, 2008, has been received and carefully reviewed.

Applicant has amended claims 47-50, 93, 94, 107, 109 and 110. In claims 47 and 48 the "preferably" phrases have been deleted, and new claim 117 has been added based on the deleted part from claim 47.

In claims 49, 50 and 93 the term "comprising shaping said polymer material by extrusion into or onto a supporting unit in the extrusion station," has been introduced. Support for this language can be found in claims 44 and 45. Claim 94 is also amended to depend from claim 93 (which it did in the originally filed claims).

In claim 107 the term "onto a supporting unit," was amended to recite the phrase "onto a supporting unit comprising said carcass and said inner liner."

Claims 109 and 110 were amended to depend from claim 107 (which it did in the originally filed claims).

The Examiner has made the Restriction Requirement in the previous Office Action final, and has withdrawn claims 51, 52, 54, 95-99, 108, 109 and 112-116 as being drawn to a non-elected invention. Applicant notes that claim 109 is now amended to depend from claim 107 (as originally filed), and as such, Applicant requests that claim 109 be rejoined with the pending claims.

Rejection under 35 U.S.C. §112

The Examiner rejected claims 47-50, 93, 94, 107, 110 and 111 under 35 U.S.C. §112, second paragraph, as being indefinite. The Examiner rejected claims 47 and 48 due to the term "preferably" which the Examiner believes renders the claims unclear. Claims 49, 50, 93 and 94 were rejected for lacking the proper antecedent basis for the term "the supporting unit". Claim 107 was rejected as unclear. Claims 110 and 111 were also rejected as lacking the proper antecedent basis for the term "the gas permeation barrier layer".

Applicant has amended claims 47-50, 93, 94, 107, 109 and 110, and in view of these amendments, Applicant respectfully requests withdrawal of these rejections.

Rejections under 35 U.S.C. §103(a)

The Examiner rejected claims 42-28, 53, 55-93, and 100-106 under U.S.C. § 103 as being obvious over Sjoberg et al. (USP 6,106,761) in view of Hardy et al. (USP 5,918,641) and either of Hirokazu et al. (USP 3,513,228) or Kent (USP 2,528,523). The Examiner states that it would have been obvious, to one of ordinary skill in the art, at the time the invention was made, to modify the teaching of Sjoberg et al. and to have ensured that no cross-linking takes place in the extruder by lowering the extruder temperature below the peroxide activation temperature, as suggested by Hirokazu et al. or Kent, to produce a pipe with a smooth surface and which flows smoothly. The Examiner also states that it would have been obvious to one

of ordinary skill in the art, at the time the invention was made, to modify the teaching of Sjoberg et al. as suggested by Hardy et al., to produce a flexible pipe having a suitable structure suitable for offshore use, with a cross-linked polyethylene layer. Applicant respectfully traverses this rejection.

When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references. See In re Geiger, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987). see also Richdel, Inc. v. Sunspool Corp., 714 F.2d 1573, 1579-80, 219 USPQ 8, 12 (Fed. Cir. 1983) ("Most, if not all, inventions are combinations and mostly of old elements."). "An Examiner may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an Examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be an illogical and inappropriate process by which to determine patentability." Sensonics, Inc. v. Aerosonic Corp., 81 F.3d 1566, 1570, 38 USPQ2d 1551, 1554 (Fed. Cir. 1996). See also, In re Rouffet, 149 F.3d 1350, 1357-58, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998) (...To counter this potential weakness in the obviousness construct, the suggestion to combine requirement stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness).

One of ordinary skill in the art, at the time the invention was made, would have known that a flexible unbonded offshore pipe is a specific type of pipe (as explained in the application) comprising a polymer layer for sealing (often called an inner liner) and two or more helically wound wires surrounding said polymer layer. Such flexible unbonded offshore pipe must be able to transport aggressive fluids, and be able to withstand high pressures, temperatures and variations thereof during use, and furthermore, such pipe must have a long useful lifetime. Those of skill in offshore pipe industries would understand that the expected useful lifetime of offshore pipe should be at least 20 years or longer. The consequence of a leak of the polymer layer in such pipe could be catastrophic, both monetarily and environmentally.

Sjoberg et al. teach that the prior art method of initiating crosslinking of a polyethylene polymer tube was by extruding the polymer in direct contact with heated wheels in order to decompose the peroxide in the composition and initiate the crosslinking. The heat is applied to the surface of the extruded tube and permeates the tube via conduction through the polymer material. This prior art process is described in Sjoberg et al. as inefficient and likely to only crosslink the surface. Chemical cross linking of PE has been known for many years for use in production of small articles such as bottles and also for small pipes, e.g. water pipes with diameters of up to 2 cm and relatively small wall thickness.

Sjoberg et al. teaches the production of small thin-walled pipes, and discloses a method of cross-linking a polymer pipe using heat or infra-red radiation at a wavelength or wavelength which do not include the primary absorption wavelengths for the polymer being cross-linked, such that increased local surface heating is avoided. Sjoberg et al. teach the production of a tube with a diameter of 15 mm and a thickness of 2.5 mm (see col. 6 lines 37-42). The Sjoberg et al. method is in contrast to Applicant's method, where the wavelength of the radiation is the same as the absorption wavelength of the polymer (specification at page 14).

Hardy et al. disclose a flexible pipe having an inner liner of PE containing silane, which is then crosslinked by hydrolysis. Hardy et al. specifically teach that chemical crosslinking using peroxides, as in Applicant's present invention, is a technology which is not suitable for flexible offshore pipe technology:

It is known from the European Patent Application 83400256 published under the No. 0,087,344 to improve the mechanical behaviour of polyethylenes, for large diameter tubes, by chemical crosslinking using peroxides. The chemical crosslinking method requires large quantities of heat. It has never been able to be implemented on an industrial scale for producing tubes made of polyethylene for high-performance flexible structures insofar as the increase in temperatures required for obtaining the

crosslinking does not enable the tubes to support their own weight (col. 2, lines 28-37).

Thus, Hardy et al. clearly teach that one of ordinary skill in the art would have known that crosslinking of PE using peroxides would not have been suitable for use in flexible offshore pipe technology for at least two reasons:

1) It has never been able to be implemented on an industrial scale for producing tubes made of polyethylene for high-performance flexible structures, and

2) The increase in temperatures required for obtaining the crosslinking does not enable the tubes to support their own weight (softening).

Therefore, based on Hardy et al.'s clear teaching away from the use of peroxide cross-linking in the production of flexible pipe of the invention, the skilled person would not have had any motivation to combine the subject matter of Sjoberg et al. with the subject matter of Hardy et al., nor would the skilled person have had any reasonable expectation of success in doing so.

Turning now to Hirokazu et al. and Kent, both secondary references disclose traditional methods of crosslinking PE using peroxide accompanied by heat activation. However, Hirokazu et al. and Kent are only generally relevant to methods for crosslinking PE using peroxide and heat. Both are also limited to teaching wire

coatings at very thin thicknesses on the order of 100 mils to a few millimeters. In contrast, Applicant's pipes range in thicknesses up to 18 millimeters. Accordingly, one of ordinary skill in the art, at the time the present invention was made, would not find any reason or motivation to apply the teachings of either Hirokazu et al. or Kent in the production of a crosslinked PE layer for a flexible unbounded pipe in thicknesses up to 18 millimeters, and would not have any reasonable expectation of success in doing so.

Applicant submits that the prior art would not have provided anyone of ordinary skill in the art, a reasonable expectation that the combination of the method of Sjoberg et al. with Hardy et al. and/or Hirokazu et al and Kent would be successful. As stated above, Sjoberg et al. teach that one should avoid high absorption of the infra-red irradiation to avoid local overheating of the polymer and thereby damaging the polymer pipe. Even if one of ordinary skill were to have attempted to apply the teachings of Sjoberg et al. in the production of a cross-linked PE layer of a flexible unbonded offshore pipe, he or she would not have been able to obtain cross-linked PE layer of a flexible unbonded offshore pipe as made by Applicant's claimed process, because one would have applied infra-red radiation at a wavelength or wavelengths which do not include the primary absorption wavelengths for the polymer being cross-linked, in order to avoid local surface heating. However, due to the thickness of Applicant's pipe PE layer, the end product of such a process would have been a slow and incomplete cross-linking.

Applicant states that for many years and until Applicant's present invention was conceived, the method of producing cross-linked inner pipe liners, as disclosed in Hardy et al. was the only available method, even though it was very expensive, time consuming, water consuming and space demanding, compared with Applicant's claimed method. In light of this, Applicant's invention presents a large contribution to the art of producing cross-linked PE layer of a flexible unbonded offshore pipe.

In the present application, the Applicant has surprisingly found that the infra-red radiation in Applicant's method does not give rise to any undesired local heating of the PE layer even when using a radiation which is absorbed in a sufficient amount to obtain a fast and complete cross-linking. With Applicant's invention it is thus possible to obtain a cross-linked PE layer of a flexible unbonded offshore pipe with a well defined wall thickness of e.g. 4 mm or more, and a sufficient cross linking degree of 75-90 degree (ASTM D 2765) or more. Thus, Applicant found that by applying irradiation as initiator for the cross-linking simultaneously with heating the polymer, a fast and operational method which could even be used for the high quality demanding polymer layers of flexible unbonded offshore pipes could be had. In view of the foregoing, Applicant respectfully requests withdrawal of this rejection.

The Examiner presented an alternative rejection of claims 78-81 under 35 U.S.C. §103(a) as being unpatentable over Sjoberg et al., in view of Hardy et al. and either of Hirokazu et al. or Kent, as applied to the

previous rejection above, and further in view of WO 01/00381 to Heino. The Examiner states that in addition to the reasons stated in the previous rejection, Heino discloses a method for crosslinking polyethylene with infra-red radiation wherein the suitable wavelength is given as between about 0.5 micrometers to 1.2 micrometers and notes that the wavelength is readily optimized. The Examiner suggests, therefore, that it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to have optimized the wavelength of infra-red radiation employed to crosslink the PE pipe of Sjoberg et al. as suggested by Heino to arrive at Applicant's claimed invention. Applicant respectfully traverses this rejection.

Heino is directed to a method for processing a polymer or elastomer material having an additive which can be subjected to a chemical reaction by heat. In particular, Heino teaches that one of ordinary skill can conduct tests to determine the absorptive wavelengths of infra-red radiation of the additive and the polymer being used. One then introduces the infra-red radiation into the polymer material wherein the wavelength of radiation is optimally selected for penetration of the polymer material, but is absorbed by the additive material. This is accomplished by selecting the absorbing or oscillation frequency of the radiation to match those of the additive as close as possible, while at the same time avoiding the absorbing or oscillation frequencies of the polymer material (col. 3, lines 50-66, and claim 1).

Applicant submits that the process taught in Heino, like Sjoberg et al., is exactly the opposite of the process disclosed and claimed by Applicant. Applicant's claimed process identified the absorption peaks for the polymer material and matches the infra-red and/or other electromagnetic radiation to match the absorptive peaks. This allows the polymer material to heat quickly and efficiently, thereby decomposing the peroxide. The process of Heino does not accomplish this process. To the contrary, Heino adjusts the radiation frequencies so that the additive is heated and the polymer is not. As such, one of ordinary skill in the art would not have been motivated to combine the teachings of Heino in view of the other references previously cited, with any reasonable expectation of success, because Heino teaches away from Applicant's claimed invention. Therefore, Applicant respectfully requests withdrawal of this rejection.

It is believed that a full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for examination on the merits. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Respectfully submitted,
JACOBSON HOLMAN PLLC

Date: June 24, 2008
(202) 638-6666
400 Seventh Street, N.W.
Washington, D.C. 20004
HBJ/JGC/jhr

By 
Joseph G. Contrera
Registration No. 44,628

R:\jcontrera\NKT - 12791\P70074US0-Response to OA 2-5-08.doc